NASR-162

UNPUBLISHED PRELIMINARY DATA

31p

SECOND QUARTER OPERATING MANUAL

(JULY – SEPTEMBER 1963)

Describing

ARAC SERVICES TO MEMBER COMPANIES

NASA CR 51721

AEROSPACE RESEARCH APPLICATIONS CENTER · INDIANA UNIVERSITY ·

UNPUBLISHED PRELIMINARY DATA

AEROSPACE RESEARCH APPLICATIONS CENTER

Indiana ~~University~~ Foundation
Bloomington, ~~Indiana~~

SECOND QUARTER OPERATING MANUAL

(July - ~~Sept~~ember, 1963)

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ARAC SERVICES TO MEMBER COMPANIES

[1963] c.f.

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Bloomington, Indiana

SECTION 1 - ARAC OPERATIONS

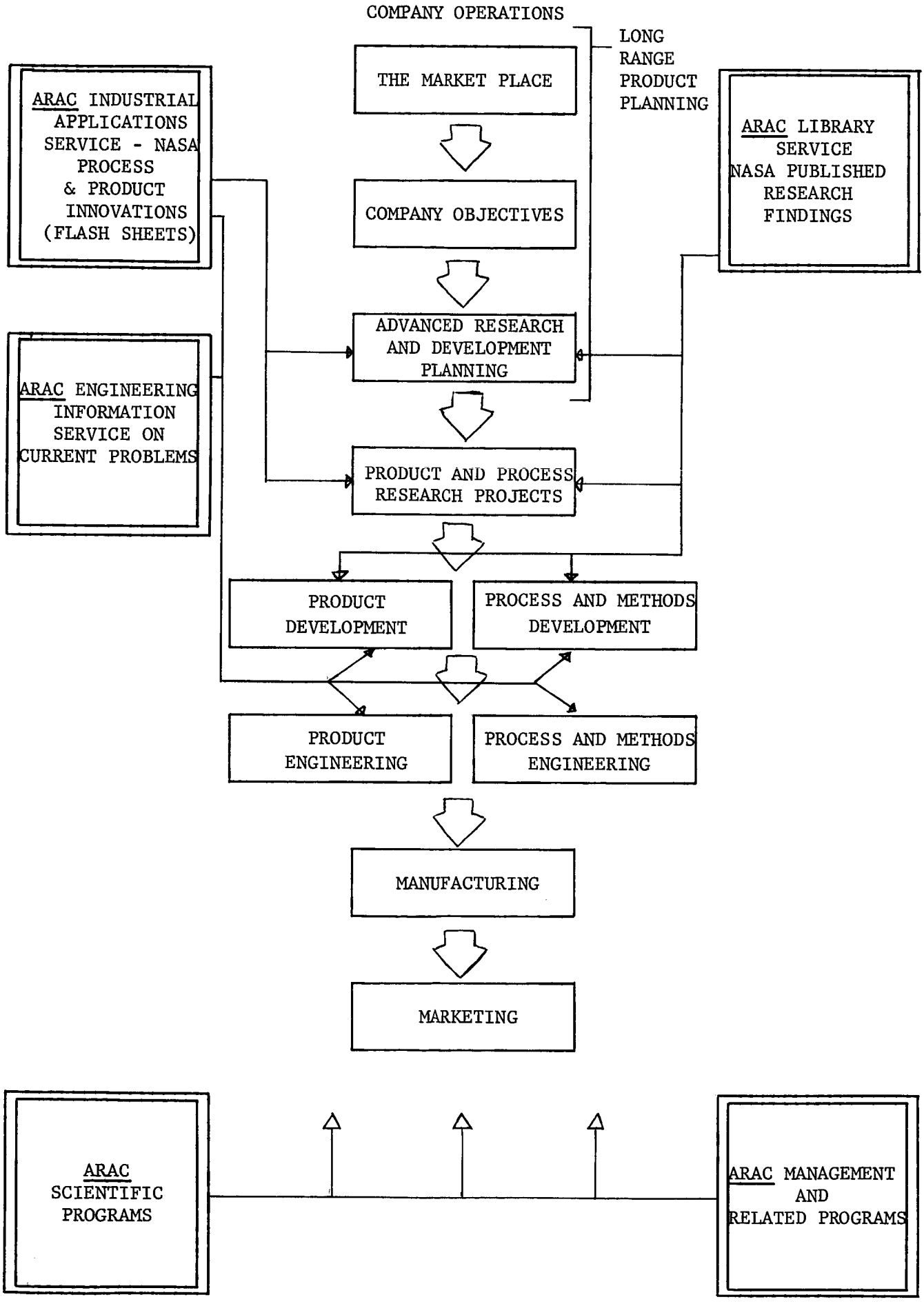
The services provided in ARAC operations are shown in the following diagram, ARAC SERVICES IN NEW PRODUCT PLANNING. In this diagram, ARAC services are shown as they relate to the progression of member company tasks from the identification of new markets and market segments, through advanced product planning, R & D planning, execution of R & D projects, product and process development, final engineering, manufacture, and marketing. The diagram is offered as a guide to the use of ARAC services by member companies.

In the following sections of this manual, each ARAC service is described simply and briefly. Member company management and technical personnel are urged to familiarize themselves with ARAC services so that their use becomes automatic in company operations.

Following the diagram is a page listing the names, titles, and telephone numbers of ARAC staff members. Member companies are urged to contact the appropriate ARAC staff member for the particular ARAC service in which they are interested. These are indicated in the sections describing each service.

The last page of this section lists ARAC member companies as of the date of publication of this manual.

ARAC SERVICES IN NEW PRODUCT PLANNING



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Indiana University Foundation
Bloomington, Indiana

Indiana University Personnel

Telephone	Name	Title
337-6647	Herman B Wells	Chairman
337-5464	Ralph E. Cleland	Co-Director
337-1908	A. M. Weimer	Co-Director
337-7425	Howard L. Timms	Associate Director for Operations
337-2951	William L. Haeberle	Associate Director for Development
337-5296	Paul Klinge	Associate Director for Science
ME 4-4451	Doris Merritt	Assistant Director for Science
337-5656	Nevin W. Raber	Technical Librarian
337-2065	E. W. Martin, Jr.	Director, I.U. Computer Center
337-1345	David Cravens	Assistant Director for Operations
337-1345	Gene Groff	Assistant Director for Research Programs
337-1911	Ralph Sprague	ARAC Representative, I.U. Computer Center
337-5656	Elizabeth Kissling	Literature Analyst--ARAC Library
337-1908	Richard L. Lesher	Administrative Assistant
	Gordon Bailey	Research Assistant
	Paul Daverio	Research Assistant
	Bruce Erts	Research Assistant
	Anthony O. Jonassen	Research Assistant
	Michael Pierce	Research Assistant

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ASSOCIATED BUSINESS FIRMS

Allison Division
General Motors Corporation
Indianapolis, Indiana

Arvin Industries, Inc.
1531 - 13th Street
Columbus, Indiana

Ball Brothers Company, Inc.
Muncie, Indiana

Cummins Engine Company, Inc.
Columbus, Indiana

Eli Lilly & Co.
Indianapolis 6, Indiana

Esterline-Angus Instrument Co.
P. O. Box 596
Indianapolis, Indiana

The Glidden Company
900 Union Commerce Building
Cleveland 14, Ohio

Hoffman Specialty Manufacturing Corp.
1700 West 10th Street
Indianapolis, Indiana

Indiana Bell Telephone Company
240 North Meridian Street
Indianapolis, Indiana

Inland Container Corporation
120 East Market Street
Indianapolis 4, Indiana

International Telephone and
Telegraph Corporation
3700 East Pontiac Street
Fort Wayne, Indiana

Kimberly-Clark Corporation
Neenah, Wisconsin

P. R. Mallory Company, Inc.
3029 East Washington
Indianapolis, Indiana

Mead Johnson & Company
2404 Pennsylvania Street
Evansville 21, Indiana

Mid-Continent Carton Corporation
3025 West Madison
P. O. Box 724
Louisville 1, Kentucky

New Castle Products, Inc.
P. O. Box 353
New Castle, Indiana

Perfect Circle Corporation
552 South Washington
Hagerstown, Indiana

Potter & Brumfield Division
American Machine & Foundry Co.
1200 East Broadway
Princeton, Indiana

Public Service Company of Indiana, Inc.
1000 East Main Street
Plainfield, Indiana

Pullman Incorporated
1414 Field Street
Hammond, Indiana

Quaker Oats Company
Room 345
Merchandise Mart Plaza
Chicago 54, Illinois

Radio Corporation of America
Front & Cooper Streets
Camden 2, New Jersey

Ryan Industries
800 East Michigan Street
Evansville 8, Indiana

Howard W. Sams & Company, Inc.
4300 West 62nd Street
Indianapolis 6, Indiana

Sarkes Tarzian, Inc.
Bloomington, Indiana

Socony Mobil Oil Company
150 East 42nd Street
New York, New York

Texas Gas Transmission Corporation
Owensboro, Kentucky

Union Carbide Corporation
Kokomo, Indiana

Westinghouse Electric Corporation
Bloomington, Indiana

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SECTION 2 - TECHNICAL LIBRARY SERVICE

MATERIALS

The basic research collection of materials in the ARAC library will be limited to the following UNCLASSIFIED series of reports deposited by the NASA Office of Scientific and Technical Information.

PRIMARY SOURCES

1. Contractor Reports. These are final reports which have been prepared by contractors' research personnel in compliance with NASA contract terms.

2. Technical Reports. These are final reports which have been prepared by NASA research personnel at various NASA installations.

3. Technical Notes. These are interim reports which have been prepared by NASA research personnel at various NASA installations.

4. Technical Memoranda. These are miscellaneous reports which had an initial restricted distribution.

5. Technical Reprints. These are both primary and secondary reports of research which has been performed by or for NASA. These reports have been published in various ways, and reprint rights have been retained by NASA.

SECONDARY SOURCES

1. Application Notes. These are compilations of research data which explain in detail the application of new techniques and processes.

2. Conference Proceedings. These reports integrate information on a major space oriented topic. They have been presented at conferences sponsored by NASA alone, or jointly with other organizations, both government and private.

3. Reliability Abstracts and Technical Reviews. These are reliability evaluations of techniques, processes and products which have been prepared for NASA. Original research reports are not available from NASA.

4. State of the Art Reports. These are reports which summarize the basic theory or current developments in limited subject areas. They have been prepared by private and governmental research personnel and may be found in all primary source series.

5. Technical Translations. These are reports of foreign research, primarily USSR, which have been published in general foreign language publications. NASA has acquired translated copies of these reports, or had them translated by commercial translating services.

6. Miscellaneous. These materials consist of reviews, handbooks, dictionaries, etc., which have been published by NASA for use by their personnel.

To supplement the materials listed above, the library staff will consult and borrow materials from the Indiana University libraries. In addition, the ARAC library will purchase various materials required by its staff and company personnel to use NASA materials effectively.

RETENTION COPIES

A retention copy of any document available from NASA will be secured for members on request. The minimum information required is the accession number and/or report number; however, the complete citation is desired.

Documents cited in an ARAC bibliography which were originally published in general, trade, and society publications will not be available. Many of these documents may be identified by the accession number of the citation which will be prefixed with the letter "A" (e.g. A63-11111).

Normally, ARAC will forward requests for retention copies to NASA Facility. Anticipated delivery time will be 2-4 weeks.

To fulfill an urgent request, the ARAC library will reproduce documents within the limits of available time and equipment. A copying charge of 5¢ per page for full size documents and 10¢ per page for microfilmed documents will be made for this service. Billing will accompany the last document reproduced on each request. Anticipated delivery time will be 5-7 days.

INDEXES

The current indexes to NASA and general aerospace information are "Scientific and Technical Aerospace Reports" (STAR) and "International Aerospace Abstracts" (IAA). The ARAC library will place one member subscription for each of these publications upon receipt of a request designating a specific addressee. These publications will be forwarded directly from the publishers to the member addressee.

INTER LIBRARY LOANS

Upon request from a member library, any document from the NASA report series in the ARAC library may be borrowed for a period of one week, in addition to travel time.

REFERENCE SERVICE

USE OF MATERIALS

The ARAC library collection is a reference collection available to member company personnel during normal working hours. Use of these materials by others will be limited to prevent interference with the library's primary mission.

PREPARING QUESTIONS

To request a library search, member companies are asked to prepare a "Library Search Request," a completed example of which is appended. Copies are available from the ARAC library, or they may be reproduced locally. In order to increase the probability of retrieving only relevant citations, state the questions as precisely as possible. To assure the necessary precision, include the basic field of knowledge, the major characteristics and limitations applicable, and a supplementary list of descriptive terms and synonyms. The latter will be most useful if the question contains technical jargon. In addition, indicate the number of references desired.

Include such additional information as, the date the report is desired, a brief statement of the situation which generated the request, the types of information not desired, a list of previous sources and literature consulted, any limiting dates, etc. Also, indicate if this request is for an exploratory study, a state-of-the-art evaluation, or to answer a specific question. All the above information is essential to formulate the proper search strategy.

SUBMITTING QUESTIONS

Requests for a library search should be mailed; however, they may be telephoned. In the latter case, the caller should be prepared to give the library all the information necessary to complete the "Library Search Request".

PREPARATION OF CITATION LIST

The report which is prepared by the library as the result of a literature search will be a list of citations taken from the NASA indexes referred to above. This report will be evaluated by ARAC staff members for relevancy and forwarded to the person who requested it, according to the distribution instructions given by the company. Transmission of this report will terminate the library's action on the question.

SUPPLEMENTARY SERVICES

CONFERENCES

To help define the question or to evaluate cited reports, the member company may request a conference. This conference will bring together the

company's representative, ARAC literature analysts and engineers, and, if desired, appropriate members of the faculty.

DATA PROCESSING

To provide library searches in depth, ARAC has access to the resources of NASA agencies and the Indiana University Research Computing Center. The latter will operate an electronic information retrieval system.

LIBRARY SEARCH REQUEST

COMPANY NAME: Abracadabra Magic Co.

COMPANY ADDRESS: Purg, Indiana

Individual to Contact for Further Information:
NAME: P. O. Darkness LOCATION: Lower Level PHONE: HE 1-1000
EXT: 0

FIELD OF QUESTION: Black Magic

QUESTION: to find an improved method of producing high heat and pressure; also new and improved torture methods

NUMBER OF REFERENCES WANTED: 1-5 ☐ 5-25 ☐ 25-100 ☐ All ☒

CHARACTERISTICS	DESIRED LIMITATIONS	ACCEPTABLE LIMITATIONS
Temperature	6000° C	1000° - 10,000° C
Pressure	200 psi	100-200 psi
Time-life span	∞	1000 years to ∞
Techniques involved	Burning, roasting, torturing by fire, etc.	Anything available on high T. torture
Components involved	Spits, furnaces, grills	Anything applying to above
Materials	Brimstone, appropriate fuel to produce T	

LIST DESCRIPTIVE TERMS AND SYNONYMS WHICH INDICATE POSSIBLE SUBJECT HEADINGS AND/OR SEARCH AREAS:

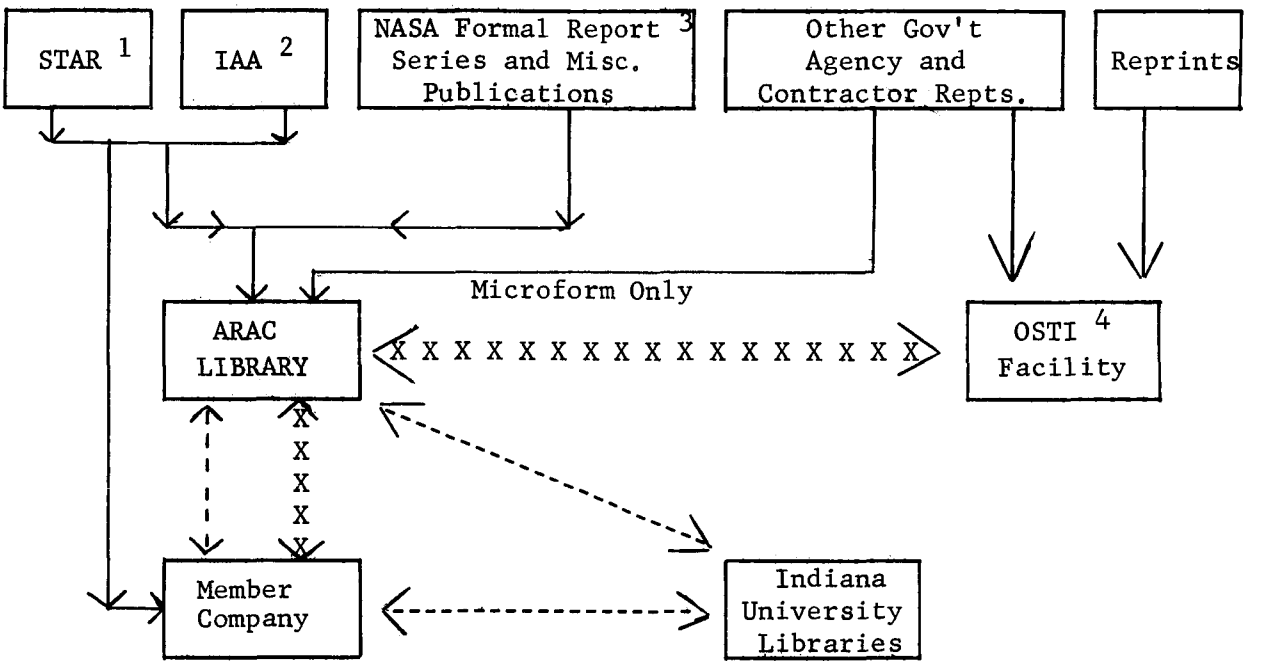
High temperature
High pressure
Fire-flame
Heat-thermal
Brimstone-sulphur
Fuel-high energy fuel
Torture-iron maiden, rack, Chinese torture, boiling in oil-pain production

ADDITIONAL INFORMATION (USE BACK OF SHEET IF NECESSARY):

We have a current problem concerning up-dating of certain of our operations. We are specifically interested in obtaining the above listed characteristics in an environment in which oxygen will be scarce. We would be willing to provide extra oxygen if necessary, but would like to keep this at a minimum. Working conditions in attaining characteristics are not of importance.

ARAC LIBRARY OPERATIONS

Materials Acquisitions



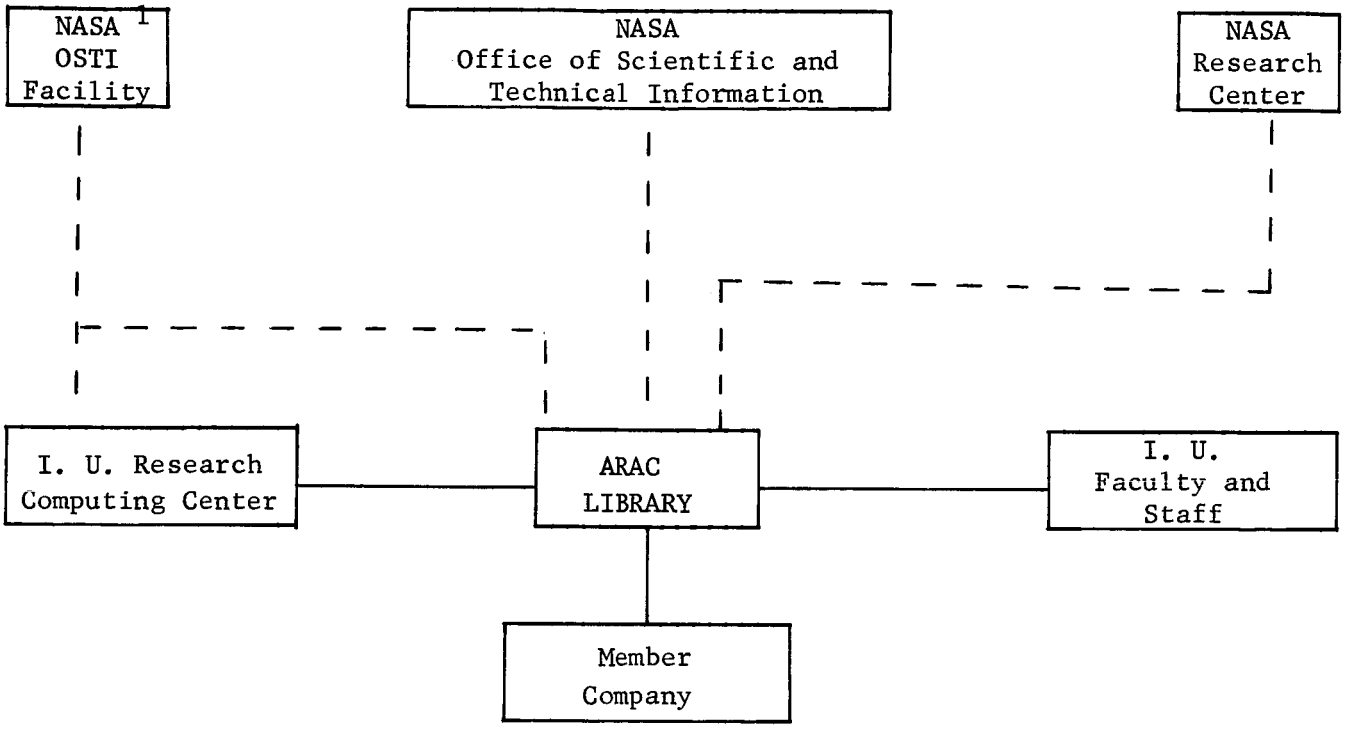
Interlibrary loans ----------
Automatic distribution_____
Retention Copies X X X X X X X X X X X X

1. Index to government reports prepared by Documentation Inc.
2. Index to scientific literature prepared by American Institute of Aeronautics & Astronautics.
3. See operations manual for detailed description.
4. Storage and reproduction agency.

ARAC library will procure retention copies of all available NASA materials upon request

ARAC LIBRARY OPERATIONS

Reference Service



Support as required _ _ _ _ _ _ _

1. Electronic data processing agency.

AEROSPACE RESEARCH APPLICATIONS CENTER

Indiana University Foundation
Bloomington, Indiana

SECTION 3 - EXPERIMENTAL SELECTIVE DISSEMINATION SERVICE

SELECTIVE DISSEMINATION SERVICE (SDS)

To supplement the operation of the manual-machine library information retrieval system, ARAC has investigated the feasibility of adding a Selective Dissemination Service for automatically notifying member companies of ARAC library receipts pertinent to their interests. The importance and usefulness of this additional service should be self evident because of the high rate of growth of NASA's document store (approximately 1,000 additions per month). Without this service, maintenance of a current bibliography for a certain project might require repeated resubmission of important "state of the art" retrieval questions.

The Selective Dissemination System will provide each member company interest center with a succinct notification of all the new library titles pertinent to that center's technical interests. The selection of these documents from the set of new incoming documents will be based on that center's interest profile (statement of technical interests). This notification will come bi-weekly based on the set of new documents abstracted in each bi-weekly issue of STAR and IAA. To facilitate quick and efficient perusal by the member company, only the citations will be listed (accession number, title, author, contract number, and source). Occasional ambiguity in title wording can be cleared up by consulting the corresponding abstract in STAR.

DESIGN OF THE SDS

There are essentially three steps in the development of this selective dissemination service: (1) the definition of member company interest centers, (2) the development of an interest profile to effectively characterize or represent each center's principle areas of technical concern, and (3) the evaluation of this profile in terms of the documents selected.

1. Interest Centers. It is well recognized that the interest centers will not be identical in organizational form and definition for all companies. In some firms these centers of interest will coincide with existing departments or divisions. In others, they may be separate laboratories concerned with basically different areas of research or development. In still other firms, they may be geographical plant locations. A guiding definition for these interest centers is that they be basically concerned with a relatively homogeneous area of technical information.

A question was raised in the June 18 meeting concerning the relation between the definition of interest centers and the "Inventory of Technical Capabilities and Interests" completed in the first quarter. Many firms experienced a certain amount of frustration attempting to identify areas of interest for the entire firm. The result was often an extremely general

cross-section of all types of information that might be helpful in the future. However, an interest center can be an existing organizational unit within the firm that has a small enough area of interest to make possible a rather specific definition of these interests, and eliminate the distribution of masses of irrelevant information to the wrong people.

For purposes of developing a selective dissemination system, at least two other characteristics are required of an interest center. First, there must be some company arrangements for receiving notification of new information and deciding on its relevance. This is not a large or demanding requirement, but someone must scan the list of titles yielded by the dissemination service and indicate which articles are desired in hard copy, which are not relevant, etc. This "information coordinator" must be familiar with the informational concerns of his interest center and be able to cooperate with ARAC advisers in developing the profile that will represent the interests of that center, and in evaluating the effectiveness of the resultant dissemination system.

2. Methods of Profiling. There are at least three possible methods of obtaining a profile of an interest center compatible with the current indexing system of the NASA documents. With the first method, the information coordinator of an interest center would draw up a three or four page description of the interest center and its basic areas of technical concern. He would explicitly use definitive phrases, nouns, and technological terms that infer the content of the center's interests. This would then be translated into a profile, much as an original document is indexed.

A second method would involve the creation of a list of phrases or key terms that characterize the content of a center's area of technical concern. These would be created by each interest center's information coordinator from his own vocabulary and knowledge of the subject area. If necessary, this list will be converted by ARAC to the NASA vocabulary of document classification through synonyms and the logical relation of words.

Still a third method of creating a profile would require the coordinator at the interest center to choose a set of characterizing key words directly from the NASA vocabulary used in indexing the basic documents.

3. Evaluation. The evaluation of the effectiveness of the selective dissemination service will be based on the number of pertinent documents received by interest centers in relation to the total number sent to them. This will be done using questionnaire techniques, interview techniques, and perhaps a combination of the two. The information coordinator of each interest center will be required to scan the titles of the documents and indicate their relevance to the interest center.

EXPERIMENTAL SD SERVICE

It is apparent that a certain amount of experimentation will be necessary in the development of this system. This will be especially important in determining the most efficient method of profiling and the most effective evaluation procedures. For this purpose we are soliciting the cooperation of 5-8 member firms during this experimental period.

Because of the current economic limitations of the system, only nine centers per company can be processed this year. This does not mean that a company must identify only nine centers to utilize ARAC services, or divide the informational needs of the company into nine areas. It does mean that nine interest centers most likely to need or use the type of information contained in the newly published NASA documents should participate in the SDS this year. This restriction will be loosened as soon as it is economically possible.

Although this is called an "experiment", it should be stressed that no interest center will be required to repeatedly develop a profile by various methods. The desirable method of profiling will become apparent through the use of the several methods among the experimental interest centers. Of course, even the information distributed to the volunteer firms during the summer period of evaluation will quite likely be of significant value to the participating interest centers.

Development Time Plan. Exhibit I presents the proposed time chart of the development of SDS. We are asking for the identification of interest centers in all member companies by July 1 or soon thereafter because this is so fundamental and necessary to the efficient use of ARAC services. The summer months of July and August will be spent primarily in operating with the interest centers of the volunteer companies. After a profile is developed by one of the methods mentioned above, the interest center will become eligible for the dissemination service. Evaluation of the yielded documents' pertinence may call for some modification of the profile and subsequent re-evaluation. With reasonable communication and cooperation in this process, the companies participating in this summer experiment will have regular (bi-weekly) dissemination service beginning in September. At this time, efforts will be directed toward developing profiles for nine (or less) interest centers for each of the other member companies, using the profiling and evaluation techniques shown to be most efficient in the summer experiment. The time required for this will vary between companies, but all companies should be serviced by SDS late this fall, hopefully by October 1.

EXHIBIT I

ARAC SELECTIVE DISSEMINATION SERVICE (SDS)

DEVELOPMENT TIME CHART

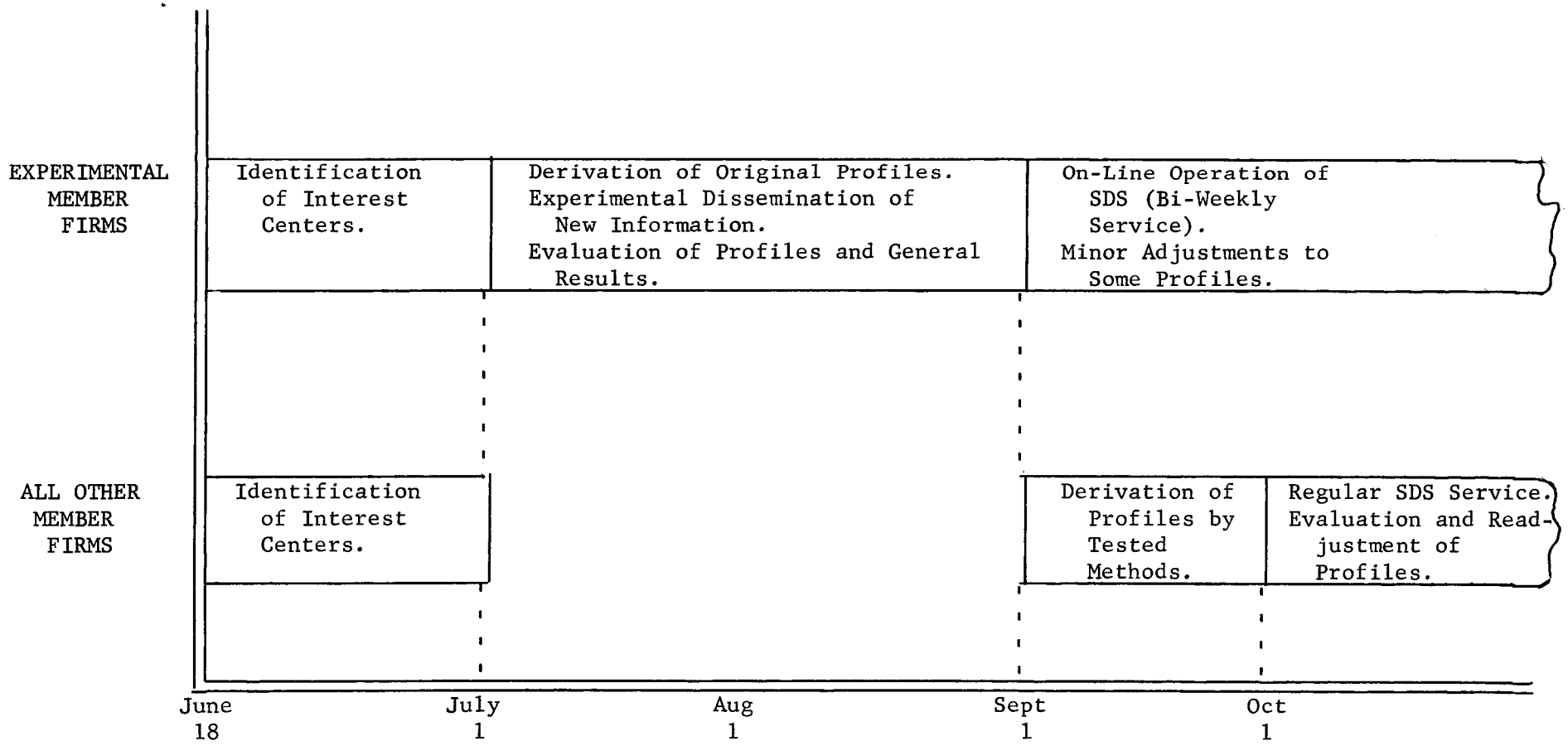


EXHIBIT II

ARAC SELECTIVE DISSEMINATION SERVICE

INTEREST PROFILES OF SELECTED
INTEREST CENTERS

INTEREST CENTER	TOPICS IN PROFILE
Geologists	1. Moon geology 2. Moon surface - earth sciences a. Physical and chemical properties b. Instrumentation c. Analysis of samples on moon surface d. Telemetering results 3. Rock properties 4. Structural geology and cratering 5. Paleontology 6. Organic matter in extra-terrestrial objects or samples 7. Polospores (pollen & spores) in space 8. Terrain studies a. Infra red b. Radar and other c. Visible light 9. Geophoto interpretations 10. Nuclear blasts in space a. Seismic detection techniques b. Electromagnetic c. Other detection 11. Electromagnetic fields 12. Geomagnetic fields
Physicists	1. Propagation of acoustic energy 2. Propagation of electromagnetic energy in earth materials 3. Neutron diffusion 4. Resonance gamma-ray scattering 5. Minerals analysis - remote techniques 6. Temperature profiling a. At sea b. On land c. By infra red 7. Laser orientation and guidance systems 8. Nuclear radiation sources 9. Gamma-ray spectrometry 10. Acoustics at low temperature 11. Neutron measurements in space 12. Magnetic measurements in space 13. Isotope measurements and techniques 14. Interaction between electromagnetic radiation and the various solid and liquid states of matter which compose the earth's crust

Physical Chemists

1. Fluid flow through porous solids
2. Capillarity in porous solids
3. Electrical conductivity or water saturated porous solids
4. Analog-digital hybrid computer
5. Numerical solution of differential equations
6. Advances in instrumentation (mechanical, optical, electronic)
7. Fluid dynamics (gas-liquid)
8. Continuum mechanics

Production Engineers and Chemists

1. Enthalpy of gas and liquid (mainly hydrocarbons, N_2, H_2, CO_2, and H_2S) components
2. Adsorption of liquid hydrocarbons from gas streams
3. Hydrocarbon phase behavior - density, compressibility, viscosity, PVT relations, solubility
4. Condensate analyses and evaluations
5. Laboratory and field floods
   a. Water floods
   b. Gas floods
6. Interfacial tension (hydrocarbon-water) measurements and procedures at elevated temperatures and pressures
7. Hydrocarbon and non-hydrocarbon component analyses
   a. Mass spectrograph
   b. Gas and liquid chromatograph
   c. Fractionation
8. Laboratory and field results and evaluations of new oil recovery techniques
   a. Miscible displacement
   b. Enriched gas studies
   c. High pressure vaporization
   d. Carbon dioxide slugs
   3. Oxygenated hydrocarbon slugs
9. Areal sweep patterns in field floods
10. Stratified vertical patterns in field floods
11. Selective plugging of permeable zones
12. Thermal recovery
13. Experimental and calculation procedures for oil and gas equilibrium separation
14. Paraffin deposition and prevention
15. Mist elimination
16. Hydrate control
17. Gas dehydration
18. Fluid flow in pipe lines
19. Emulsion control
20. Foam control
21. Instrumentation for automatic custody control
22. Evaporation losses
23. Reservoir engineering
24. Economics of hydrocarbon recovery, handling, and processing techniques

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Indiana University Foundation
Bloomington, Indiana

SECTION 4 - INDUSTRIAL APPLICATIONS (NASA FLASH SHEET) SERVICE

NASA INNOVATIONS

NASA Flash Sheets are reports of product and process innovations made by scientists and engineers employed at NASA Regional Centers, such as the Marshall Space Flight Center at Huntsville, Alabama, or by scientists and engineers at NASA prime contractors. The law requires NASA prime contractors to divulge innovations occurring in the execution of contracts.

Innovations are defined as, "A means of accomplishing a work objective either more effectively than before, or for the first time. The term includes the development, invention, discovery, modification or new use of a device, process, material, system, or technique."

NASA PROCESSING OF FLASH SHEETS

Regional Centers. Flash Sheets are written up on a special form by an Industrial Applications Office at each of the nine regional centers of NASA. Each office employs a chief and senior engineers of various types who spend all their time working up Flash Sheets. Thus, a total in excess of 50 NASA technical people are serving ARAC via Flash Sheets. Some of the innovations reported are covered by patents or patents pending, others not.

NASA Headquarters. The Flash Sheets are sent by the regional centers to the Industrial Applications Office of NASA in Washington where they are cleared for classified (secret) material and the patent situation checked out. Only non-classified Flash Sheets are available to ARAC and its member companies.

Non-Profit Research Institutes. Selected Flash Sheets are given to certain non-profit research institutes such as Midwest, Battell, Stanford, etc., for study in depth and magnification of innovations which are believed by NASA Headquarters to offer significant industrial application potential.

ARAC PROCESSING OF FLASH SHEETS

Abstracts. As ARAC receives NASA Flash Sheets, they are abstracted by ARAC staff engineers with the assistance of University science faculty members. Based on the present flow of Flash Sheets from NASA Headquarters to ARAC, all abstracts will be sent to all member companies' interest centers. Dissemination of abstracts will be to member firms in accordance with the mailing procedure prescribed by each member company.

Flash Sheet Information. ARAC will send complete information on a particular Flash Sheet to the member firm upon request. Requests for full Flash Sheet information should be based on serious interest on the part of

the requesting company. Reproduction load precludes filling requests based solely upon technical curiosity; interest in applying the innovation is a prerequisite.

Source Information. A company interest center after review of full information on a particular Flash Sheet should proceed as follows if further information is needed to decide upon initiation of a development project or action aimed at product or process improvement utilizing the Flash Sheet innovation. The interest center should request the company coordinator of ARAC operations to arrange for ARAC to obtain additional information from the Flash Sheet source. The company coordinator will send to ARAC the "REQUEST FOR SUPPLEMENTARY FLASH SHEET INFORMATION" (copy of the form shown in EXHIBIT II). Accompanying the form should be a list of specific technical questions which will identify the type of information and answers required beyond those provided in the Flash Sheet.

Using the specific list of questions furnished by the member company to identify the information desired, ARAC will communicate the request to NASA Headquarters or the appropriate NASA regional center. ARAC will arrange for a face-to-face, phone, or letter contact between the company representative and the applicable NASA scientist or engineer. The member company will be advised as to the appropriate action it should take to obtain the requested supplementary information based on arrangements made with NASA by ARAC.

ARAC SPECIAL SERVICES

Industrial Applications Reports. From time to time ARAC will send Industrial Applications Reports to member companies. These reports will contain an explanation of ideas for commercial applications generated by teams of ARAC engineers, literature specialists, and faculty members from the University science departments. Often these reports will be the result of ideas generated by such teams in their study of NASA Flash Sheets. These reports will be kept on file in the ARAC library and disseminated to companies whose technical interests warrant this.

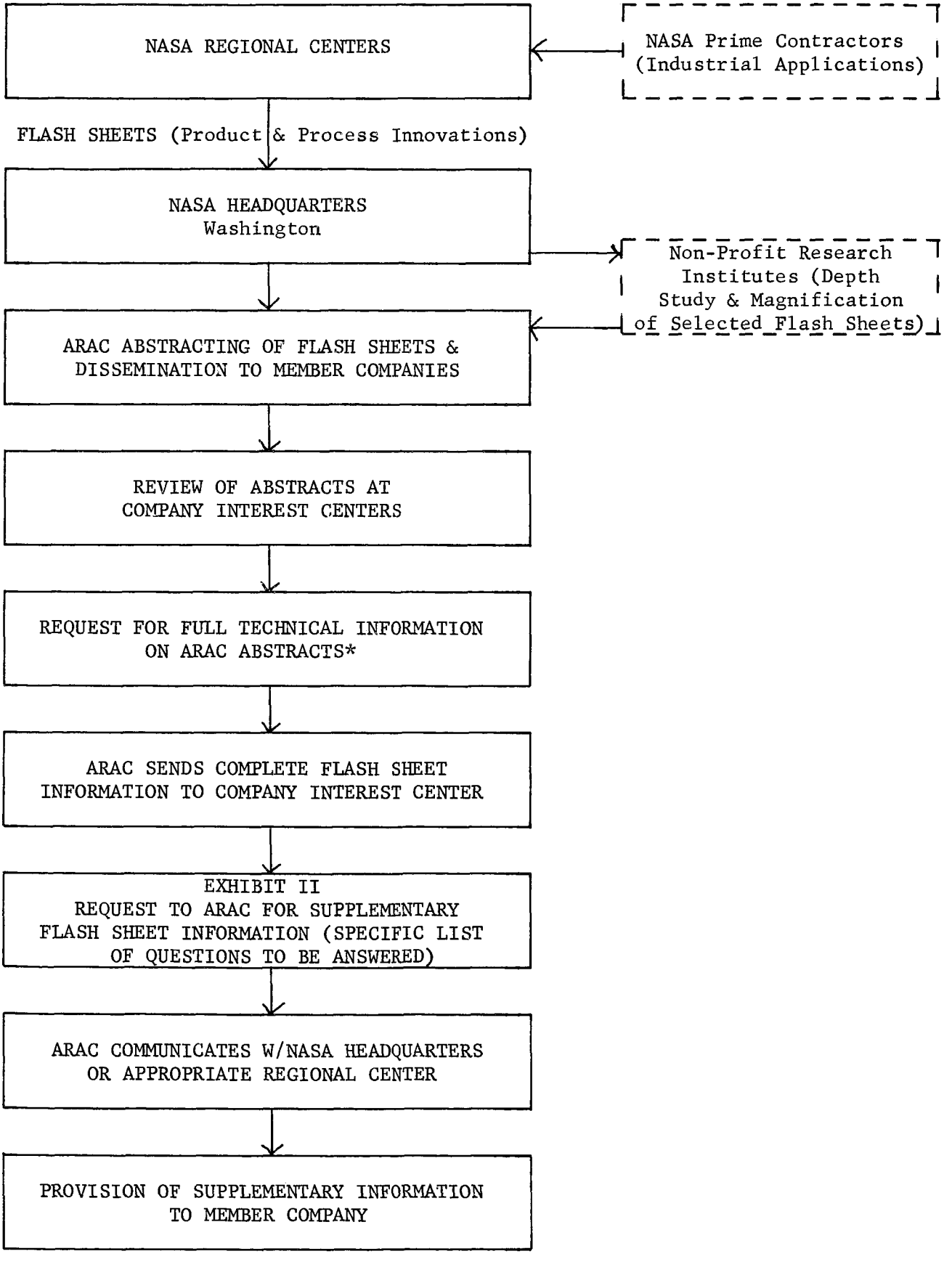
Flash Sheet Panel Discussions. From time to time, collections of Flash Sheets on particular subjects of general interest to a number of member companies may warrant the use of a panel discussion at ARAC. These panel discussions may center on the needs of a single company or may involve participants from several interested member companies. Selected faculty members from Indiana and other universities, and other recognized authorities on the subject may be involved in the various discussions. These panel discussions may be initiated at the request of a single company, several companies, or ARAC.

SUMMARY

The above procedures involving NASA Flash Sheets are summarized by the diagram in EXHIBIT I. Correspondence on these ARAC Services should be directed to the Associate Director for Operations, Aerospace Research Applications Center, Indiana University Foundation, Bloomington, Indiana.

EXHIBIT I

INDUSTRIAL APPLICATIONS SERVICE
DISSEMINATION OF FLASH SHEET INFORMATION



*Intention to apply the innovation is a prerequisite for processing requests beyond this point.

EXHIBIT II

REQUEST FOR SUPPLEMENTARY FLASH SHEET INFORMATION

CONFIDENTIAL

DATE _____

TO: Associate Director for Operations
Aerospace Research Applications Center
Indiana University
Bloomington, Indiana

Dear Sir:

Please make appropriate arrangements to obtain for us additional information beyond that contained in Flash Sheet No. _____, Subject _____.

The additional information in which we are interested is indicated by the questions shown on the attached sheet. Our interest in this Flash Sheet can be served best by our acquiring this additional information by (date) _____ at the latest.

We certify that our interest in having this additional information is relevant to the final stage of determining whether or not we should proceed with a development project involving innovation(s) contained in the above-mentioned Flash Sheet.

SIGNED _____

TITLE _____

FIRM _____

ADDRESS _____

_____

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Indiana University Foundation
Bloomington, Indiana

SECTION 5 - ENGINEERING INFORMATION SERVICE ON CURRENT PROBLEMS

Member companies will have current engineering problems that ARAC may help solve through its knowledge of current technical developments at the various regional centers of NASA. Most of these problems will be concerned with current products, processes, and materials, whereas the technical information services of ARAC involving the use of the Technical Library (Section 2 and Section 3), and NASA Flash Sheets (Section 4) are focused on new products, processes, and materials (see diagram, Section 1, ARAC SERVICES IN NEW PRODUCT PLANNING).

Staff engineers of ARAC will spend time at NASA regional centers for the purpose of getting acquainted with current research projects. Likewise, ARAC staff engineers will, upon invitation, visit member companies to learn current technical problems. Out of such visits may come a matching of current unpublished NASA research findings to current company technical problems.

As an example of this service, ARAC staff engineers learned in a visit to one NASA regional center that its engineers were in the late stage of research in leak detection techniques. Obviously this subject is of great importance in design, building, testing, and operation of space vehicles. Many companies have similar problems in connection with production, testing, and operation of products involving a vacuum or inert gas atmosphere. Solutions to these company problems may be found in current NASA research activities.

When a "match" of current NASA research or engineering and member company current problems is achieved, ARAC staff engineers will aid the member company in formulating specific technical questions about their problems, then transmit the questions to the appropriate person in NASA. Questions of a broad nature, or general questions, cannot be handled in this service. The reason for this is obvious. For instance, if a question on leak detection were framed as, "We want to know all about leak detection," we could only reply that the inquiry will be answered when a NASA Technical Report is available in the ARAC Library.

Member companies may transmit current technical problems by phone or in writing to the Associate Director for Operations. In such cases, the problem should be made specific, with enough background and related information provided to insure proper interpretation by ARAC personnel. This service is characterized by speed of operation.

It is obvious that practical procedures for disseminating NASA information to companies on a national basis cannot include many services in which direct contact with individual NASA scientists and engineers is involved, as this would interfere seriously with NASA's main objectives involving the exploration of space. Accordingly, this service on current engineering

problems, which does involve direct contact with NASA technologists, should be utilized by member companies with discretion.

For instance, this service should not be used to displace other means by which companies normally solve their current engineering problems. Rather, it should be used only when these other means are exhausted. In particular, it should not be used in lieu of normal company functions. For instance, this service cannot be used in lieu of normal company purchasing activity to track down suppliers of materials, unless such materials are uniquely related to a product or process development project initiated by NASA generated technology, and not generally available.

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SECTION 6 - SCIENCE PROGRAMS

University scientists participate in ARAC operations in two classes of activity: Continuing services to member companies, and Special Services to member companies.

CONTINUING SERVICES TO MEMBER COMPANIES

1. Consultation Service to ARAC Full-Time Staff. University scientists provide consultation to ARAC full-time staff personnel in their provision of services to member companies as described in other sections of this manual (Technical Library Service, Industrial Applications (Flash Sheet) Service, Engineering Information Service on Current Problems).

2. Panel Discussions. The ARAC staff has identified certain major interest areas of member companies. When appropriate, a panel discussion of specific major problems in these areas will be initiated with representatives of member companies and University scientists. This has been done for the member companies in the petroleum industry.

3. Weekly Bulletin of University Scientific Events. Representatives of member companies are strongly urged to attend the events of appropriate topics which are listed on a weekly bulletin of seminars, conferences, discussions, and lectures sent to member companies.

While the information discussed in these programs may be of great value to representatives of member companies, another benefit which may be of equal value will be the informal discussion after the program and the opportunity to meet University scientists.

Names and addresses of company representatives who desire these notices on a continuing basis should be sent to the ARAC office.

4. Significant University Scientific Publications. Some of the publications describing University scientific programs and facilities have already been mailed to member companies. Others will be sent as they are developed. These describe major research interests and facilities of the University, and some list the faculty involved and their backgrounds. Suggestions for additional literature which should be developed will be most welcome.

5. Research Reports. The I.U. Foundation issues regular reports of research grants and projects under way and those which have just been granted to the University. These are remarkably specific indications of our research interests, faculty involved, and the trends of research in certain broad scientific areas. The reports constitute a valuable source of ideas for further industrial work as well as names of outstanding scientists who are interested in specific projects. These will be sent regularly without request to each member company.

SPECIAL SERVICES TO MEMBER COMPANIES

In most cases the special services provided to ARAC member companies by University scientists require special financial arrangements (as opposed to the continuing services described above, which do not).

We are confident that these special services are an excellent source of fresh new ideas for the research and development activity of a company. University scientists, with their up-to-date information and broad experience, may very well supply a spark which the company's personnel will find valuable in their work.

The various special services are described below. Arrangements for these services must in all cases be made through the ARAC Associate Director for Science before contact is made with individual faculty scientists.

1. Consultation Service. The University science faculties include internationally known authorities in various fields which are described in the publications noted above. Many of these scientists may be engaged as consultants by member companies. Consultation service may be arranged for one or two days, or on a regular continuing basis.

Usually this consultation service involves a visit to the company site, but sometimes company representatives may wish to confer with a scientist on this campus. In any case, if an appreciable part of a day is involved or subject preparation by the scientist is necessary for the visit, then specific financial arrangements with the scientist should be made through the Associate Director for Science.

Consultation has been termed the most profitable relationship which a company may have with a University scientist. The scientists' different backgrounds and approach to problems are often quite stimulating to an industrial Research and Development staff for fresh insights often are generated.

2. Panel Discussions. When a group is convened to discuss a specific research topic, the discussion which results often sparks new ideas and reveals new information on old problems which are useful to all discussants. Bringing together University scientists and company personnel who are knowledgeable about a specific topic may be done within a member company. This is really a type of consultation. The member company may prefer the panel to be convened here on the campus.

3. Joint Research Proposals. One of the features of many NASA and Department of Defense research projects is the fact that they are joint ventures of a company and a University. One complements the other in resources and facilities. The Associate Director for Science will assist in the preparation of such proposals.

4. Fellowships. There are many advantages to both the University and a company in the awarding of fellowships. To the company, this may be the opportunity to identify outstanding graduate students who may be potential employees. Also, the research performed by the recipient may be valuable for the company. This is an important means of assisting education, and in so doing, a potential immediate benefit for the granting company.

5. Research Grants by a Company to the University. Company interests often dictate further research in an area for which it lacks facilities or staff with appropriate background, or for which the length of time involved is too great for normal company operations. These are often the type of research projects in which a University scientist may be interested. Contact the Associate Director for Science for details of faculty interest areas.

6. Endowed Professorships. While at first glance this appears to be of sole benefit to the University, there are real opportunities for a company in setting up this sort of arrangement. If the characteristics of the recipient are appropriately drawn, the holder of this title may be performing research work of direct and indirect benefit to the company. Also, he will probably be available for part-time work in the company. His role in the education of graduate students will, in effect, produce a team of researchers working on common problems.

Another variation of this idea is the employment by the University of a company employee who by his competence and background complements the University faculty as a colleague. He may be put on a part-time or full-time faculty basis in the University, but a substantial fraction of his salary is sustained by the company. One example is the employment of an electronics engineer, paid by a company, in a local medical school because his interests were in the medical field. Such people serve also to keep in close touch with bright researchers coming through the graduate program.

7. Short Courses for Company Personnel. There are many research areas which are so new that short courses for company personnel will prove valuable. An example is a short course on statistical methods for biological researchers. If these are substantial enough, University credit arrangements may be made.

8. Assistance in Research Proposal Preparation. The business of writing proposals to government agencies for research grants to a company is a time-consuming and delicate art. One of the comments made by a government representative is that, on the average, such proposals from midwestern companies are poorly drawn. The Associate Director for Science and other staff members who are experienced in this work are available for assistance.

9. Undergraduate Scholarships. Undergraduates in the science departments are encouraged early in their careers to become involved in research. Financial support is of great benefit in the encouragement of bright young researchers as scholarship money is in short supply. Recipients may be children of member company employees. These undergraduates are also potential summer employees of significant value to companies.

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SECTION 7 - MANAGEMENT AND RELATED AREAS PROGRAMS

CONTINUING PLANNING SERVICE

ARAC will provide service on a continuing basis to managements of member companies in developing operating plans and procedures at the member companies, and between them and ARAC, directed toward more effective long range planning for new markets and products to fill these markets, thence back into the identification of technical interests involved, as indicated in SECTION I - ARAC SERVICES IN NEW PRODUCT PLANNING. ARAC operations will then be conducted to stress serving these technical interests.

REPORTING NASA DEVELOPMENTS IN MANAGERIAL TECHNIQUES

Under the direction of the Associate Director for Development, faculty members of the Graduate School of Business will review new managerial techniques and processes developed as a result of NASA's operations and where considered applicable will report these to member companies.

QUARTERLY MEETINGS

Quarterly meetings of top management personnel of the member companies will be held in part to review ARAC operating experiences, and in part to consider new managerial developments.

CURRENT MANAGEMENT PROBLEMS SERVICE

Member companies are invited to make requests in writing or by telephone to the Associate Director for Development for assistance on specific managerial problems. He will forward printed materials if they are directly available or where required, visit member company offices.

The following procedure is recommended:

1. Representatives of member companies should write or call the Associate Director for Development relative to requests for information on managerial and related problems.

2. The Associate Director for Development will provide information either by telephone, memorandum or by forwarding printed materials or where required, prepare special reports.

3. Upon request and with appropriate lead time, the Associate Director for Development and/or members of his staff, will visit member company offices to discuss their managerial and related problems.

MANAGEMENT PANELS, SEMINARS, AND WORKSHOPS

ARAC will arrange for panel discussions, seminars, and workshops on selected subjects of interest to management. Specialized personnel will be provided by ARAC for these activities. For instance, companies interested in PERT sent representatives to a workshop on this subject. Experts in the subject of a day's program are obtained from the faculty of the Graduate School of Business, other universities, and industry as required.

This service may be initiated at the request of one or more member companies or at the suggestion of ARAC. The topics of these panels and seminars may cut across the entire field of management interest--top management, functional management (marketing, finance, production, accounting, etc.), management training and development, personnel practices, etc.

When more extensive managerial consulting services are required, the Associate Director for Development will assist companies in identifying consultants who may meet their requirements, but individual consulting arrangements should then be worked out between company representatives and the consultants involved.

MANAGEMENT PUBLICATIONS

ARAC member companies will regularly receive without request publications of the Graduate School of Business such as Business Horizons, The Indiana Business Review, and pertinent publications, including research reports of the Bureau of Business Research, on managerial subjects.